

To: Bill Shaffer

From: Jim Goddard

Subject: Improving IB Joint Tolerances and Strength to  
Achieve WT Joint Performance

Comments:

1. Resin Reinforcement / Additives – With the resin requirements in the proposed AASHTO M294M specification, adding fillers to the resin would be just about impossible. Getting a specification change to permit such additives probably could not be done in the next ten years, given the current AASHTO climate. I see no way to limit such materials just to the bells.
2. Resin Requirements – With the new (proposed) resin requirements in AASHTO M294M, the resins used should be more uniform, and, therefore, more consistent in terms of shrinkage (maybe).
3. Larger gaskets – The down-side to larger gaskets may be greater insertion forces, leading to customer complaints and pipe damage in the field. It is a narrow line we have to walk.
4. Electro-Fusion Joints – These might be appropriate for certain applications, but are expensive and represent a process unknown to the common storm sewer installer.
5. Thicker bells – To determine the required wall thickness to resist elongation under some given internal pressure the standard equation is:

$$t = pd / 2s$$

where:  $t$  = wall thickness (in.)  
 $p$  = pressure (psi)  
 $d$  = outside diameter (in.)  
 $s$  = allowable stress (psi)

Because the required tests take time under pressure, and because PE is a viscoelastic material, I would suggest using 1,000 psi as the allowable

stress (s). Given that, and the requirement to pass 10.8 psi internal pressure, the minimum bell thicknesses, with a safety factor of 2, would be:

Diameter	Bell Outside Diameter	Wall Thickness
inches	inches	inches
12	14.46	<b>0.1562</b>
15	17.57	<b>0.1898</b>
18	21.20	<b>0.2290</b>
24	27.20	<b>0.2938</b>
30	35.12	<b>0.3793</b>
36	41.60	<b>0.4492</b>
42	47.70	<b>0.5152</b>
48	54	<b>0.5932</b>
60	66	<b>0.7128</b>

Even at these thicknesses, at 10.8 psi the elongation in the bell will be 0.5%.

6. Adding a post forming reinforcing ring of fiberglass or some similar material might be the best answer. We should try this. There are issues:
  - a. will the bells continue to shrink after the reinforcing ring is installed?
  - b. Cost?
  - c. Production issues?
7. Redefining "watertight" would not be easy, nor would it be widely accepted.

These are my very quick comments.

cc: Tom King